5-21-2013

0.1 Extracting Curve Parameters from Raw Function Time Series

We observe the function value at the measurement times $t_1 \dots t_j$, not the latent curve parameters. However, for the sake of calculating $\mu^a_{pop}, \mu^b_{pop}, \mu^c_{pop}$, we do need to, for each patient, extract their curve parameters. We accomplish this using least squares curve fitting, ensuring that the curve parameters obey their constraints. More specifically, for each patient i, we want to:

$$\begin{aligned} \text{minimize} \sum_{j=1}^{m} (g_i^*(t_j) &- g_i(t_j; s_i, a_i, b_i, c_i))^2 \\ \text{subject to} & \\ a_i &\in (0,1) \\ b_i &\in (0,1) \\ c_i &\in (0,\infty) \end{aligned}$$

For curves where the function value does not drop (or even increases) after treatment, a will be quite small or even 0, and the fitted curve may be flat when the actual curve rises. However, we view this as unavoidable due to the restrictions of the kinds of curve we allow in our model.

0.2 Exploring relation between patient covariates and function curve parameters

Now that we have parameterized patient function curves, we can explore the relationship between various covariates and curve parameters. Recall from previous plots that the covariates that seem to affect the curve shape the most are age and the pre-treatment function level. On the following few pages, for each of the 3 side effect function values, and for each of treatments, and for each of those 2 covariates, we make 4 scatter plots. For each scatter plot, the x-axis is the covariate, and the y-axis is 1 of 4 curve parameters: a, b, c, and also the quantity $a + (1-a)b$, which is equal to the total initial drop in function value, relative to the pre-treatment function value. This last quantity is labelled as 'drop' in the scatter plots. Trends in these scatter plots would lead us to believe that the coefficients in the generalized linear models for the a, b, c parameters would be non-zero.

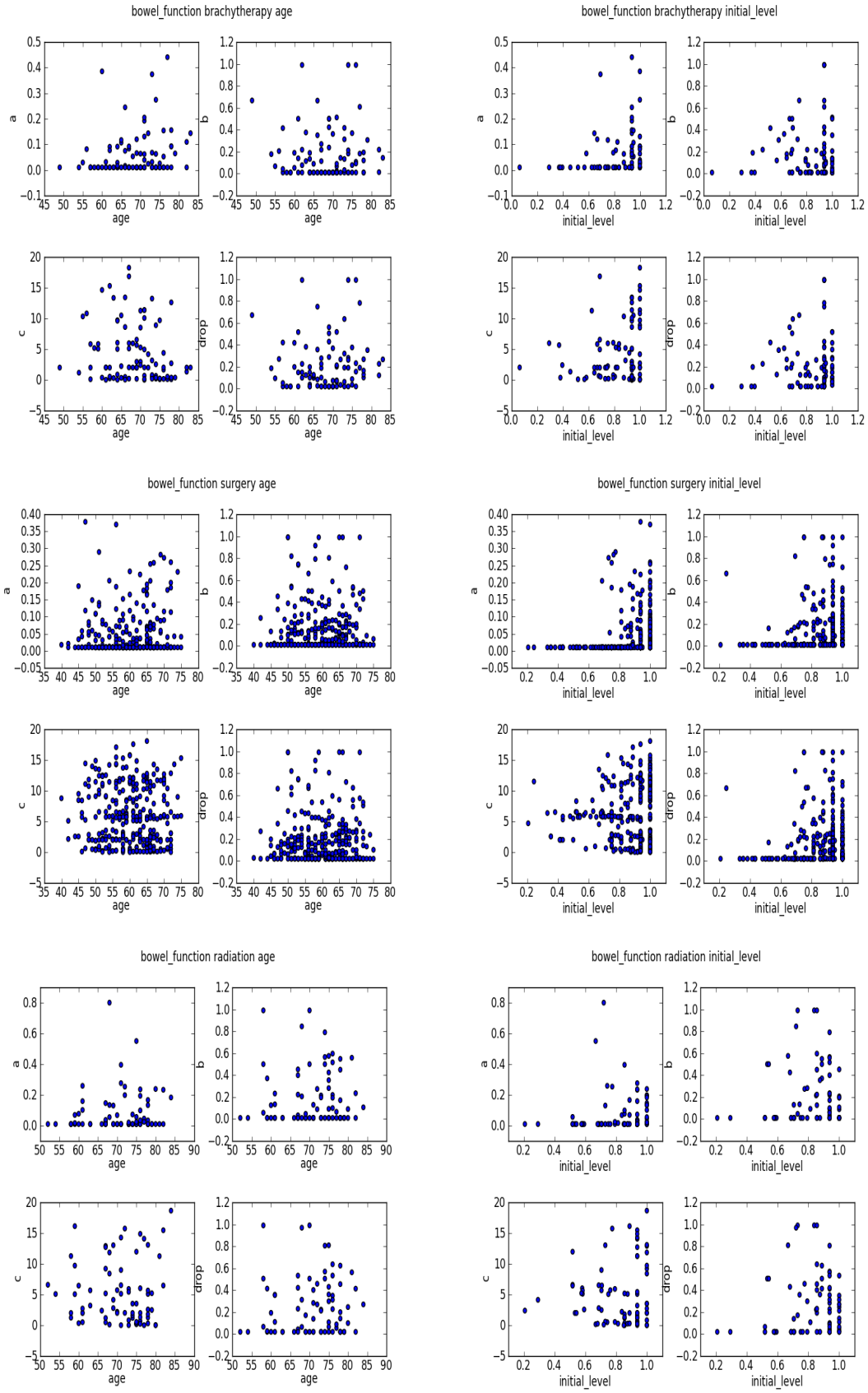

Figure 1: Plots of bowel function curve parameters vs initial function level and age attribute, stratified by treatment

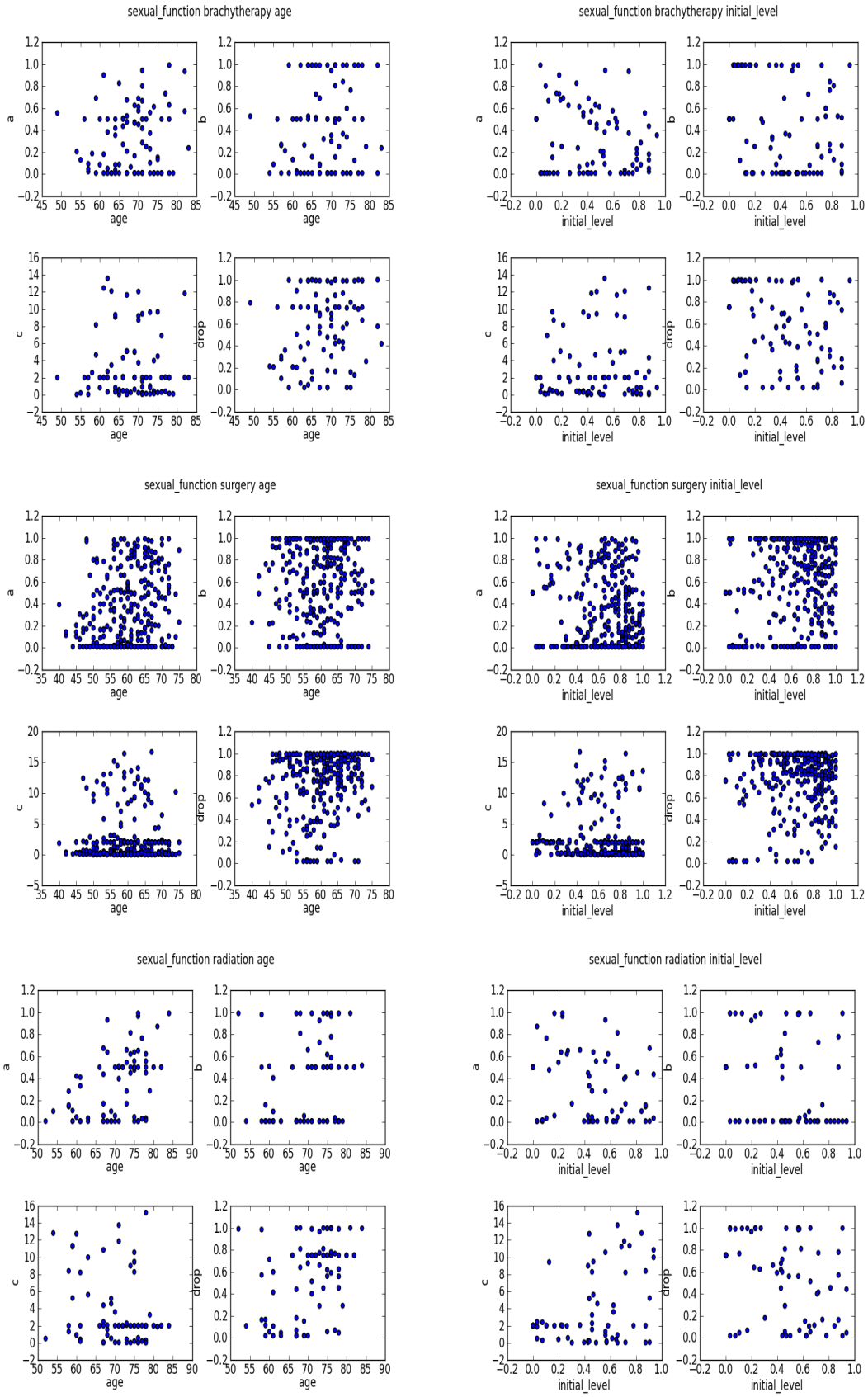

Figure 2: Plots of sexual function curve parameters vs initial function level and age attribute, stratified by treatment

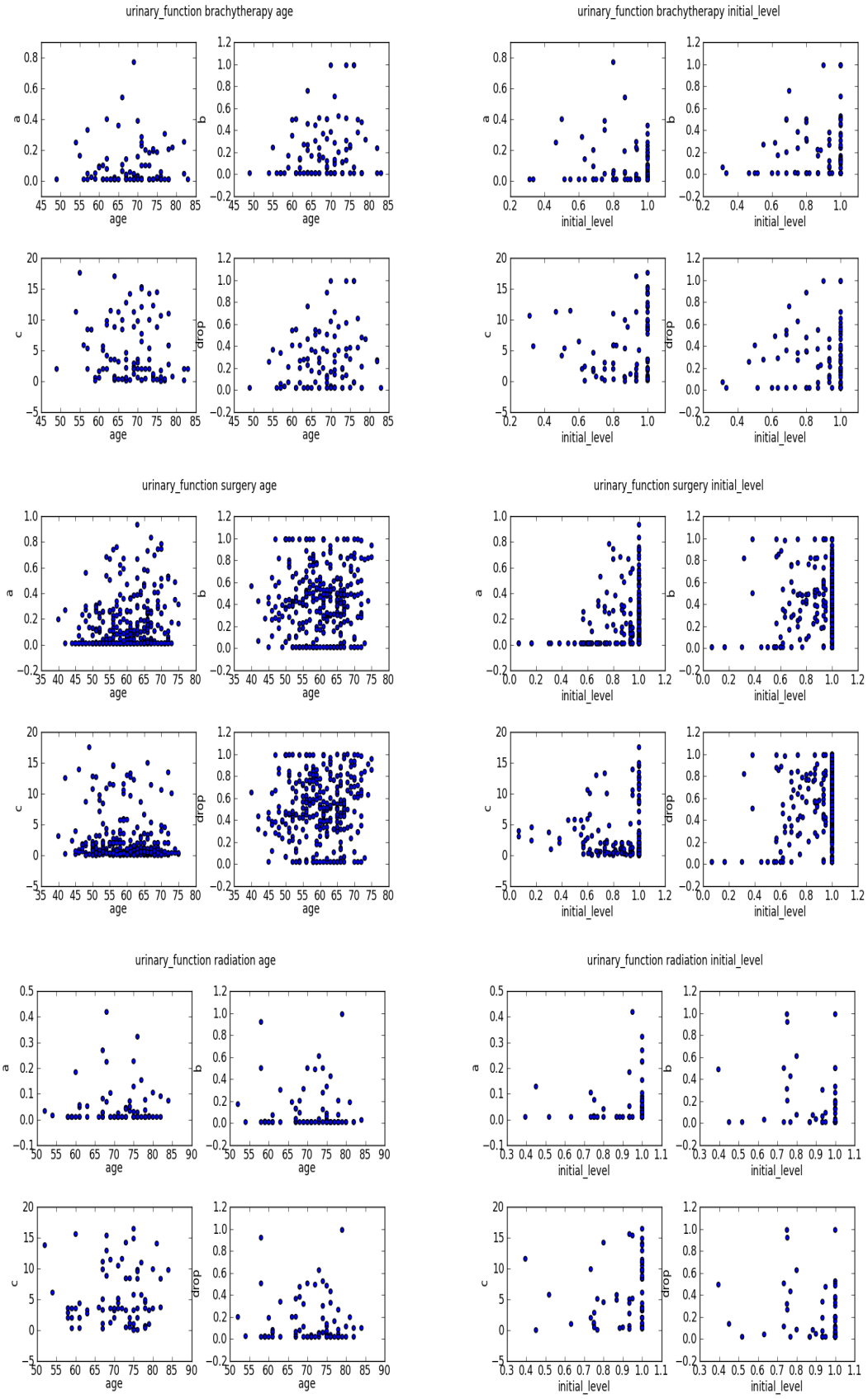

Figure 3: Plots of sexual function curve parameters vs initial function level and age attribute, stratified by treatment